Serial No.: 10/698,028 **Docket No.: 300111171-2 (1509-467)**

Amendments to the Drawings:

The attached replacement drawings include changes to Figures 2, 3a-6b, 7b-d and 9-12.

REMARKS

The Office Action of January 6, 2006 has been carefully studied.

Applicant notes the allowance of claims 17-27.

Replacement Drawings for Figures 2, 3a-6b, 7b-d and 9-12 are submitted in response to the objections at page 2 of the Office Action.

Applicant traverses the rejection of claims 1-4, 9-10, 14 and 16 as being unpatentable over Eguchi, U.S. Patent 5,498,762, in view of Takano, Japanese application 405061021A. As discussed *infra*, Eguchi and Takano are directed to different types of liquid crystal display (LCD) devices. Consequently, one of ordinary skill in the art would not have modified Eguchi as a result of Takano. The combination results from the Examiner reviewing Applicant's claims and casting around to find features of Applicant's claims 1 and 16 upon which claims 2-15 depend. Because the features are in different types of LCDs, the rejection is wrong.

The Office Action states Eguchi discloses a bistable liquid crystal display device comprising two cell walls enclosing a layer of ferroelectric smectic liquid crystal material 15, wherein at least one of the cell walls is translucent, and at least one electrode on each of the cell walls applies an electric field across liquid crystal material of the LCDs.

Figure 1 of Eguchi is an embodiment of a bistable LCD; its operation is described from column 4, line 52 to column 5, line 6. In the Figure 1 embodiment, the LCD is bistable because it employs ferroelectric liquid crystals (FLC) of type SmC or SmH. SmC/SmH refers to smectic type C/H liquid crystals. The cell includes two substrates with transparent electrodes. Alignment is achieved by rubbed electroconductive polymer layers, which cover transparent electrodes. The FLC materials and alignment layers are placed between the substrates. Thickness between

the substrates is controlled by spacer beads placed between the substrates. The rubbing directions on the pair of substrates must be parallel or antiparallel or cross each other with a small intersection angle; see column 4, line 52 – column 5, line 6.

As is well known in the art, FLC material exhibits bistability due to specific molecular and structural features. Due to an electrical dipole moment, molecules of FLC material respond to the polarity of electrical field and switch between stable states under reversed electrical unidirectional fields, moving in a conical path, (Fig. 2 and Fig. 3). In both stable states, the molecules are planar aligned and an optical effect is achieved due to azimuthally different states of the FLC molecules.

The same effects that are achieved with the FLC materials is not attained in nematic LC materials that Takano employs. This is because nematic LCs do not exhibit bistable features and respond equally to electrical pulses with different polarity. In this regard, a matrix addressed nematic device must be driven by a continuously applied voltage or by pulses from an active matrix of thin film transistors, as Eguchi mentions at column 1, lines 24-26, in describing the prior art.

Takano employs a nematic LC with dispersed 200 nm silica particles. The abstract indicates an optical effect is achieved due to the strong light scattering effect, which the mixture exhibits under applied voltage. The Takano system appears to be quite similar to the nematic device with silica nanoparticles, mentioned by Crawford, U.S. Patent 5,956,113 at column 1, lines 52-53, which also exhibits scattering effect and is driven by AC voltage. Takano uses 200nm particles for a strong scattering effect. Therefore, the Takano device is very different from the Eguchi device, and cannot be a basis for modifying the Eguchi device for forming nematic bistable device with orientational electrooptical effect. The Eguchi device has identical

rubbed polymer alignment layers on both substrates and the cell is arranged in such way, that "the rubbing directions applied to the pair of substrates may be parallel or anti parallel to each other or may cross each other with small intersection angle"; see column 7, lines 5-8.

It is well known that nematic LC molecules are switched zenithally. Consequently in the Eguchi cell, in which both surfaces have planar alignment, bistable switching of nematic LC is not optically distinguishable. After applying the unipolar pulses with different polarity, the cell adopts equal zenithally reverted molecular orientations, which are not optically distinguished.

This consideration shows that the devices of the prior are reference relied upon by the Examiner are different by geometry, used materials, operational principles and optical performance. The proposed combination of the prior art references does not lead one of ordinary skill in the art to the combination of independent claims 1 and 16.

Applicant disagrees with the Examiner's comments at page 6, lines 1-3 of the Office Action with regard to claim 14, i.e., that Eguchi teaches the use of at least one polarizer for distinguishing between different optical states of the liquid crystal material; (column 11, lines 32- 45). However, Eguchi discloses, at column 11, lines 32 -45 , that "... liquid crystal cell was sandwiched between ***a pair of 90 degree-cross nicol polarizers*** to provide a liquid crystal device..." (Emphasis added). Therefore the Examiner's comments about claim 14 are incorrect.

The Eguchi display employs FLC materials wherein molecules switch from one stable state to another due to electrical dipole moment. For such switching operation, the FLC is placed in the cell with a narrow thickness of 0.1-3 micron. The switching operation untwists the spiral of the FLC material lying along the cell (column 4, lines 63-67, column 5, lines 1-6). Internal surfaces of the cell have alignment layers having rubbed electroconductive polymer layers. In such a geometry, the molecules move in a conical path to switch between stable states in

response to pulses with opposite polarity (Fig. 2 and Fig. 3). Therefore, in both states, the molecules are planar aligned and the optical effect is achieved due to the azimuthally different states of the molecules in the FLC material. As a result, unipolar pulses with different polarity provide two equal zenithally reverted molecular orientations, which are not optically distinguished.

Applicant traverses the rejection of claims 6 and 11-13 under 35 U.S.C. 103(a) as being unpatentable over Eguchi in view of Takano, further in view of Crawford , U.S. Patent 5,956,113.

As independent claims 1 and 16 are not obvious from the disclosures of Eguchi and Takano, claims 2-15 which depend on claim 1, are patentable, and the Examiner's rejections of these claims are therefore moot, and withdrawal thereof is in order. In addition, many of these claims are not obvious from the secondary references applied against them..

The Examiner's comment on page 9, regarding the concentration of nanoparticles concludes:

> Therefore, it would have been obvious to one of ordinary skill in the art at the art at the time the invention was made, to have used silica particles with a size in the range of 5 to 50 nm, in an amount within the ranges of from 0.1 to 25 % by weight, from 1 to 15 % by weight, and from 1 to 5% , as the silica particles in the liquid crystals layer composition of Eguchi in view of Takano, **in order to provide a weakly scattering state even after the voltage is removed from the liquid crystal display, as taught by Crawford"** (Emphasis added).

Applicant does not agree. Adding nanoparticles stabilizes the electrical field induced molecular orientation, because **the cell modulates polarized light;** see page 11, paragraphs [0025], [0026] of the present application. As indicated at page 18, paragraph 0039 of the present application, the orientation effect which modulates polarized light during bistable switching and

"the optics of the cell will be fully determined by the liquid crystal as in conventional nematic cells"; see page 18, paragraph [0039] of the specification of the present application. Because scattering effects negatively act on optical performance of the device defined by claims 6 and 11-13, one of ordinary skill would not have modified Eguchi as a result of the applied secondary references. Therefore, the Eguchi device combined with Takano and Crawford would operate differently from each other and produce different optical effects.

Applicant traverses the rejection of claims 7 and 8 under 35 U.S.C. 103(a) as being unpatentable over Eguchi in view of Takano, further in view of Bryan-Brow, WO 97/39382. The Bryan-Brown device is not bistable and adopts different monostable LC alignments depending on the magnitude of an applied electric field. Also, the nematic liquid crystal has negative dielectric anisotropy. Thus, the Eguchi, Takano and Bryan-Brown devices work in different ways, and one of ordinary skill in the art would not have combined their disclosures with any reasonable expectation of success.

Applicant traverses the rejection of claim 15 as being unpatentable under 35 U.S.C. 103(a) over Eguchi in view of Takano, further in view of Thurston (Mechanically Bistable Liquid Crystal Display Structures). Thurston indicates that dissolving (mixing) a pleochroic dye into a liquid crystal provides optical contrast between the vertical and horizontal states and is thus used with at least one polarizer (column 2073a, first paragraph below Fig.6) to distinguish between the different optical states of a liquid crystal. Thurston has no indication of switching between vertical and horizontal states. In the structure of claim 15, nanoparticles suspended in a pure nematic LC exhibit an electrical charge. However, it is not obvious from the combination of references that this mixture with an additional component causes the same effect.

In view of the foregoing amendments and remarks, favorable reconsideration and

allowance are in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 08-2025, and please credit any excess fees to such deposit account.

Respectfully submitted,

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Date: April 5, 2006

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